WASHINGTON STATE DEPARTMENT OF ECOLOGY

December 2009 (Revised May, 2010)

GENERAL USE LEVEL DESIGNATION FOR BASIC (TSS), ENHANCED, & OIL TREATMENT
&
CONDITIONAL USE LEVEL DESIGNATION FOR PHOSPHORUS TREATMENT

For

Americast's Filterra®

Ecology's Decision:

Based on Americast's submissions, including the Final Technical Evaluation Report, dated December, 2009 and additional information provided to Ecology dated October 9, 2009, Ecology hereby issues the following use level designations:

1. **A General Use Level Designation for Basic, Enhanced, and Oil Treatment.**
2. **A Conditional Use Level Designation for Phosphorus Treatment.**

The Conditional Use Level Designation expires on December 1, 2011 unless extended by Ecology, and is subject to the conditions specified below.

Ecology's Conditions of Use:

Filterra® units shall be designed, installed, and maintained to comply with these conditions:

1. **Each Filterra® unit shall be sized for Basic and Oil Treatment using a filter hydraulic conductivity of 35.46 inches/hour (assuming a hydraulic gradient of 1.41 inch/inch as listed in the TER) using the sand filter module in the latest version of the Western Washington Hydrology Model (WWHM) or other Ecology-approved continuous runoff model. The model must indicate the unit is capable of processing 91 percent of the influent runoff file. The Filterra® unit is not appropriate for oil spill-control purposes.**
2. **Each Filterra® unit shall be sized for Enhanced Treatment using a filter hydraulic conductivity of 24.82 inches/hour (assuming a hydraulic gradient of 1.41 inch/inch as listed in the TER) using the sand filter module in the latest version of the WWHM or other Ecology-approved continuous runoff model. The model must indicate the unit is capable of processing 91 percent of the influent runoff file.**
3. **Each Filterra® unit shall be sized for Phosphorus Treatment using a filter hydraulic conductivity of 35.46 inches/hour (assuming a hydraulic gradient of 1.41 inch/inch as listed in the TER) using the sand filter module in the latest version of the WWHM or**

other Ecology-approved continuous runoff model. The model must indicate the unit is capable of processing 91 percent of the influent runoff file.

4. **Each site plan must undergo Filterra® review before the unit can be approved for site installation. This will ensure that site grading and slope are appropriate for use of a Filterra® unit.**
5. **Filterra® media shall conform to the specifications submitted to and approved by Ecology.**
6. **Maintenance includes removing trash, degraded mulch, and accumulated debris from the filter surface and replacing the mulch layer. Inspections will be used to determine the site-specific maintenance schedules and requirements. Maintenance procedures should follow those given in the most recent version of the Filterra® Installation, Operation, and Maintenance Manual.**
7. **Filterra® commits to submitting a QAPP by May 15, 2010 for Ecology review and approval of a new test site that meets the TAPE requirements for attaining a GULD for phosphorus treatment. The QAPP must be submitted for a minimum of one site where the unit is to be used for phosphorus treatment.**
8. **Filterra® shall submit a TER for Ecology review for phosphorus treatment by December 1, 2011.**
9. **Filterra® units come in standard sizes. The minimum size filter surface-area is determined by using the sand filter module in the latest version of WWHM or other Ecology approved continuous runoff model. Model inputs include**
    a. **Filter media depth: 1.8 feet**
    b. **Effective Ponding Depth: 0.75 feet (This is equivalent to the 6-inch clear zone between the top of the mulch and the bottom of the slab plus 3-inches of mulch.)**
    c. **Side slopes: Vertical**
    d. **Riser height: 0.70 feet**
    e. **Filter Hydraulic Conductivity: Must be back-calculated assuming a target infiltration rate of 35 inches per hour (enhanced treatment) or 50 inches per hour (Basic, oil, or phosphorus treatment). Hydraulic conductivity in the WWHM includes the effective ponding depth as well as the filter media depth.**
10. **Filterra® may request Ecology to grant deadline or expiration date extensions, upon showing cause for such extensions. Lack of funds to complete the monitoring will not be viewed by Ecology as sufficient cause.**
11. **Discharges from the Filterra® units shall not cause or contribute to water quality standards violations in receiving waters.**

Applicant: Americast

Applicant's Address: 11352 Virginia Precast Road
Ashland, VA, 23005

Application Documents:

- State of Washington Department of Ecology Application for Conditional Use Designation, Americast (September 2006)
- Quality Assurance Project Plan Filterra® Bioretention Filtration System Performance Monitoring, Americast (April 2008)
- Quality Assurance Project Plan Addendum Filterra® Bioretention Filtration System Performance Monitoring, Americast (June 2008)
- Draft Technical Evaluation Report Filterra® Bioretention Filtration System Performance Monitoring, Americast (August 2009)
- Final Technical Evaluation Report Filterra® Bioretention Filtration System Performance Monitoring, Americast (December 2009)
- Technical Evaluation Report Appendices Filterra® Bioretention Filtration System Performance Monitoring, Americast, August 2009 Draft)
- Memorandum to Department of Ecology Dated October 9, 2009 from Americast, Inc. and Herrera Environmental Consultants

Applicant's Use Level Request:

General Level Use Designation for Basic, Enhanced, and Oil Treatment and Conditional Use Level for Phosphorus Treatment.

Applicant's Performance Claims:

Field-testing and laboratory testing show that the Filterra® unit is promising as a stormwater treatment best management practice and can meet Ecology's performance goals for basic, enhanced and oil treatment and has the potential to meet Ecology's goal for phosphorus treatment.

Findings of Fact:

1. Field-testing was completed at two sites at the Port of Tacoma. Continuous flow and rainfall data collected during the 2008-2009 monitoring period indicated that 89 storm events occurred. Water quality data was obtained from 27 storm events. Not all the sampled storms produced information that met TAPE criteria for storm and/or water quality data.
2. During the testing at the Port of Tacoma, 98.96 to 99.89 percent of the annual influent runoff volume passed through the POT1 and POT2 test systems respectively. Stormwater runoff bypassed the POT1 test system during nine storm events and bypassed the POT2 test system during one storm event. Bypass volumes ranged from 0.13% to

15.3% of the influent storm volume. Both test systems achieved the 91 percent water quality treatment-goal over the 1-year monitoring period.

3. Infiltration rates as high as 133 in/hr were observed during the various storms. No paired data that identified percent removal of TSS, metals, oil, or phosphorus at an instantaneous observed flow rate was provided.
4. The maximum storm average hydraulic loading rate associated with water quality data is <40 in/hr, with the majority of flow rates < 25 in/hr. The average instantaneous hydraulic loading rate ranged from 8.6 to 53 inches per hour.
5. The field data showed a removal rate greater than 80% for TSS with an influent concentration greater than 20 mg/l at an average instantaneous hydraulic loading rate up to 53 in/hr (average influent concentration of 28.8 mg/l, average effluent concentration of 4.3 mg/l).
6. The field data showed a removal rate generally greater than 54% for dissolved zinc at an average instantaneous hydraulic loading rate up to 60 in/hr and an average influent concentration of 0.266 mg/l (average effluent concentration of 0.115 mg/l).
7. The field data showed a removal rate generally greater than 40% for dissolved copper at an average instantaneous hydraulic loading rate up to 35 in/hr and an average influent concentration of 0.0070 mg/l (average effluent concentration of 0.0036 mg/l).
8. The field data showed a average removal rate of 93% for total petroleum hydrocarbon (TPH) at an average instantaneous hydraulic loading rate up to 53 in/hr and an average influent concentration of 52 mg/l (average effluent concentration of 2.3 mg/l). The data also shows achievement of less than 15 mg/l TPH for grab samples. Limited visible sheen data was provided due to access limitations at the outlet monitoring location.
9. The field data showed low percentage removals of total Phosphorus at all storm flows at an average influent concentration of 0.189 mg/l (average effluent concentration of 0.171 mg/l). The relatively poor treatment performance of the Filterra® system at this location may be related to influent characteristics for total phosphorus that are unique to the Port of Tacoma site. It appears that the Filterra® system will not meet the 50 percent removal performance goal when the majority of phosphorus in the runoff is expected to be in the dissolved form.
10. Laboratory testing was performed on a scaled down version of the Filterra® unit. The lab data showed an average removal from 83-91% for TSS with influents ranging from 21 to 320 mg/L, 82-84% for total copper with influents ranging from 0.94 to 2.3 mg/L, and 50-61% for orthophosphate with influents ranging from 2.46 to 14.37 mg/L.
11. Permeability tests were conducted on the soil media.
12. Lab scale testing using Sil-Co-Sil 106 showed percent removals ranging from 70.1% to 95.5% with a median percent removal of 90.7%, for influent concentrations ranging from 8.3 to 260 mg/L. These laboratory tests were run at an infiltration rate of 50 in/hr.

13. Supplemental lab testing conducted in September 2009 using Sil-co-sil 106 showed an average percent removal of 90.6%. These laboratory tests were run at infiltration rates ranging from 25 to 150 in/hr for influent concentrations ranging from 41.6 to 252.5 mg/l. Regression analysis results indicate that the Filterra system's TSS removal performance is independent of influent concentration in the concentration rage evaluated at hydraulic loading rates of up to 150 in/hr.

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